own with British money. It generally represents the larger denominations of coin, and is chiefly used in purchasing wives, pigs, and paying fines and debts amongst the natives. It generally forms the principal hoarded wealth of a family and constitutes one of the chief values of heirlooms.

THE ECOLOGY OF THE LAND MOLLUSCA OF ASHEVILLE, NORTH CAROLINA

BY A. F. ARCHER

Although Asheville, North Carolina, is very accessible, it has not up to the present time been studied from the point of view of its mollusk fauna. In June 1934 a collecting trip was undertaken to Asheville for the purpose of studying the *Polygyrae* of the *Stenotrema* group, and along with this much data were obtained on the land mollusks in general. The places in which the collections were made consisted of the eastern part of the city of Asheville, Sunset Mountain and Rich Mountain (also known locally as Rich Knob). Sunset Mountain flanks the whole eastern side of Asheville and rises to an elevation slightly exceeding 3100 feet above sea-level. It is part of a horse-shoe shaped mountain mass, and is itself the western arm of the shoe, Rich Mountain forming the center of the loop, and rising to an altitude of 3535 feet, and Piney Mountain forming the eastern arm of the shoe. The shoe itself embraces a basin known as Chunn's Cove.

To understand the present day ecological conditions it is necessary to note the past history of the locality. Anthropoeic (human) factors have been the most active in producing the present conditions and in altering the ecology of the mollusks. Clearing and fires have produced certain perceptible changes, as is apparent if one studies for purposes of contrast the same faunal assemblage in less disturbed localities. These changes have been as great in the case of the mollusks as they have been in the case of the plants. The Asheville area has been repeatedly fired and lumbered. Fires here as elsewhere have been very detrimental to some species, and beneficial to others. However, it is not intended here to discuss the reasons for this, but simply to state as a fact

that which cannot be gainsaid by those who have had adequate field experience.

There are at Asheville two main vegetation zones. The first zone, zone A, extends from the settled portion of eastern Asheville and extends a short distance above the city to about the 2500 feet contour line. The second zone extends from the 2500 feet contour line to the top of Sunset and Rich mountains. There is no sharp line of demarcation between the two zones. The mollusk fauna will be described separately for each zone.

Zone A. The vegetation of this zone is of the *Kulturboden* type. It is here proposed to use an English equivalent for this well known German term, and refer to it as the culture area. The ground plants of the culture area of Asheville consist of a hodgepodge of weeds, vines, and brambles, as well as grasses on some of the level areas. As is so characteristic throughout the Blue Ridge physiographic province, honeysuckle (*Lonicera*) is the most conspicuous ground plant especially on sloping banks and stone walls. It takes hold readily on the soft red clay soil of this region. Brambles (*Rubus*) occur only in small patches where fires have created suitable conditions. Poison ivy (*Rhus toxicodendron*) occasionally occurs mixed with honeysuckle on sloping banks. Among the trees, the locust (*Robinia*) and the tree of heaven (*Ailanthus glandulosa*) are characteristic.

The outcropping rocks are azoic, and consist of gneisses. The red clay which forms the soil of this region is very soft, and gullies rapidly if there is no plant cover to hold it in check.

The mollusk fauna of this zone is poor in species, but rich in individuals. The species are as follows:

Agriolimax agrestis (L). This slug is common throughout the city and in the section at the foot of Sunset Mountain, but does not appear higher up. It has the *reticulata* pattern figured in J. W. Taylor, Monograph of the Mollusca of the British Isles, 1900–1907, p. 142, plate XV, fig. 3, but is distinctly yellower. It inhabits the edges of cement sidewalks, and during wet weather crawls on the lawns. It also lives in large numbers in honeysuckles both in exposed and shaded areas.

Retinella praecox H. B. Baker. A single dead specimen was found in honeysuckles.

Hawaiia minuscula (A. Binney). This snail occurs rarely in grass and under stones. It is also found in honeysuckles.

Polygyra altispira Pilsbry. The form occurring at Asheville differs from that occuring at higher altitudes in neighboring regions by being more depressed and having surface hairs that are longer and softer to the touch. In color the shell is a deeper brown, much like *Polygyra stenotrema* (Pfr.). This is the most common snail in the zone. It was found in great numbers living in honeysuckles along the edge of backyards and around outhouses. It was likewise very common in honeysuckles on the upper parts of sloping banks of a shaded ravine. Here the ground under the honeysuckle mat is paved with pieces of broken dishes, glass, fragments of flower pots and other kinds of less perishable rubbish, as well as small stones. During active spells it may be seen crawling on the stems of the honeysuckles. It is somewhat less common in honeysuckles around and on stone walls.

Polygyra rugeli (Shuttleworth). This species, somewhat less common than the previous species, lives in precisely the same habitats. However, it is more common than *P. altispira* on stone walls and at the bases of rock ledges. During inactive spells it secretes itself between or under stones, and in fact anywhere that it can crawl completely out of sight.

Polygyra albolabris major (A. Binney). One dead specimen of this species was found in some honeysuckles.

Zone B. The vegetation of this zone is mostly of the woodland type with the exception of a few cleared spots. The predominant plant association is the oak-hickory subclimax association. Intermingled with it are patches of oak-pine associations. The latter are especially favored on dry slopes by the frequent fires. The normal climax association of this area is the chestnut-chestnut-oak-yellow poplar association. The oak-hickory association has been favored by lumbering, but evidences of the climax association can be seen in the presence of numerous buckeyes (*Aesculus*) and yellow poplars (*Liriodendron tulipifera*), all young trees. Shrubs such as rhododendron and blueberries (*Vaccinium*) are present in patches. Ground plants consist of poison ivy, poison oak, Virginia creeper (*Psedera*), and lily of the valley

(*Convallaria majalis*). Brambles are not common in this zone except where there have been recent fires. Several cleared spots occur on or near the top of Sunset Mountain. They contain a growth of shrubs especially sumac, a fairly thick covering of grasses, clover (*Trifolium pratense*) and occasional strawberry patches. Some of the pastures have pines growing in them.

The soil on the higher levels is of a lighter color than that described for zone A. The rock outcrops are gneisses. In the woodland the ground is covered with leaf mould which is thin in the most recently fired spots. In the oak-pine patches the leaf mould is frequently acid and permeated with a white mould. The land snail fauna is as follows:

Haplotrema concavum (Say). Sunset Mountain. This species is rare. It lives under leaf mould.

Euconulus chersinus (Say). Sunset Mountain. This uncommon species lives under logs and in leaf mould in the oak-hickory woods near the top of the mountain.

Retinella praecox H. B. Baker. Sunset Mountain. This species is found occasionally in leaf mould and does not appear to be confined to any one section of the mountain.

Mesomphix perlaevis Pilsbry. Sunset Mountain; Rich mountain. A number of dead specimens were collected, but the living ones were few. The species is most usually found living on the high banks above the road. It lives in leaf mould and occasionally under rotten logs.

Gastrodonta interna (Say). Sunset Mountain. This species is apparently the most common and universally distributed zonitid in the locality. It is of great importance as an indicator of former fires, for it is favored by fires, and appears as one of the species of the fire succession group, is common under charred logs, and is as equally at home in oak-pine woods as it is in oak-hickory woods. It also lives in leaf mould and under uncharred logs. In pastures it may be found in considerable numbers under logs or rotten planks in company with *Zonitoides elliotti* and *Polygyra rugeli.*

Zonitoides suppressus (Say). Sunset Mountain. The local form is somewhat larger (diameter 6.7 mm.) than the form of the Piedmont of Pennsylvania (diameter 5.3 mm.), and its early

whorls are a brighter horn color than in the case of the latter form. It is almost entirely confined to the grassy areas around the sumac. It lives deep down in the grass completely hidden from view.

Zonitoides gularis (Say). Sunset Mountain; Rich mountain. This is another species that is favored by fires. It is most common in leaf mould often in acid areas, but avoids the neighborhood of pines. It is occasionally found under logs.

Zonitoides elliotti (Redfield). Sunset Mountain; Rich Mountain. This species is partial to pines. It is common under logs in pastures as well as under charred pine logs and rotten hardwood logs.

Zonitoides arboreus (Say). Sunset Mountain. This species is widely distributed, but nowhere common. It lives in leaf mould and under logs both in pine and hardwood areas.

Helicodiscus parallelus (Say). Sunset Mountain. A single specimen was found in some leaf mould in Chunn's Cove.

Gonyodiscus perspectivus (Say). Sunset Mountain. This species is nearly confined to Chunn's Cove. It is almost abundant under logs. It also lives in heavy leaf mould and around the bases of rocks. It is a small form (diameter 7.0 mm.), and is strongly angulated in the immature stages.

Philomycus caroliniensis (Bosc). Sunset Mountain. One adult was found crawling on a stump near the toll house.

Polygyra altispira Pilsbry. Sunset Mountain; Rich Mountain. This species is one of the more common species in zone B, but does not occupy the dominant position that it occupies in zone A. It is very unevenly distributed, being absent from the neighborhood of pines. Although it so commonly associated with hemlocks and balsams at higher altitudes, it seems to abhor pines. It is most common in the hardwood areas. It inhabits the treeless rocky banks above the road where it lives under leaf mould, but is scarcer in the woods above the banks. It is quite as common under charred hardwood logs as it is under any other kinds of longs, even unburned ones. Some of the logs under which it lives are partly overgrown with poison ivy. Occasionally, specimens occur in the more shady parts of the woods under dead leaves or logs.

Polygyra inflecta (Say). Sunset Mountain; Rich mountain. Apparently absent from zone A, it is widely distributed over the upper part of the mountain. It lives side by side with its close relative *P. rugeli* under logs and in leaf mould, but is not nearly as common as the latter. It is quite often present under charred logs and in dead leaves among rocks.

Polygyra rugeli (Shuttleworth). Sunset Mountain; Rich Mountain. This species is one of the most common and widely spread species in the zone. It is the dominant fire succession snail. It is common under charred logs in patches of pines. It is also common in the hardwoods under logs and in patches of pines. Its eggs are frequent in the leaf mould and under logs, and are laid in clutches of five or six. It is also frequent around rocks and on stone walls covered with honeysuckles bordering the road. Occasionally it may be found in pastures under logs.

Polygyra tridentata (Say). Sunset Mountain; Rich mountain. This species is most common on the Rich Mountain slope of Chunn's Cove where it lives under slabs of gneiss. It is a moderate sized form (diameter 16.5 mm.).

Polygyra thyroidus (Say). Sunset Mountain. This was found on the banks above the road where it is rare. It is a light colored form with a nearly closed umbilicus.

Polygyra albolabris major (A. Binney). Sunset Mountain. Due to fires this species is scarce. One fine living specimen was found under some sumac leaves.

Cochlicopa lubrica (Müller). Sunset Mountain. This species is rather uncommon. It lives in leaf mould and under pieces of bark and rotten logs. The local form does not seem to share the tendency to live in cleared territory that is so usual in members of the species in other parts of the world. This local form is referable to subspecies *appalachicola* Pils. However, *appalachicola* does not seem to be a true geographical race, for it crops up in Cheboygan County, Michigan, a long way out of its supposed range. Then too there are colonies in parts of Europe that are hard to distinguish from it.

Pupoides marginatus (Say). Sunset Mountain. One specimen was found in the grass in a clearing.

As a further word about fires and snail indicators of pyric

factors, taking *Polygyra* as the most dominant and characteristic genus in eastern North America, it will be seen that in undisturbed localities the large *Mesodon* type is quite as abundant and conspicuous as either the medium sized *Triodopsis* type (in the old sense) or the relatively small *Stenotrema*. When the balance is upset by some factors such as fires the latter two types are favored while the first is distinctly reduced in numbers. The truth of that is readily seen at Asheville where the large mesodons are reduced to a point where they barely maintain themselves.

JAMAICAN LAND SNAILS, 3

BY H. BURRINGTON BAKER

(Plate 3)

The first paper of this series appeared in the July number; the symbols used are explained on pages 7 to 9.

Geomelania minor densecostata new subspecies. Fig. 5.

With growth threads on later whorls finer and more closely crowded (51 on last); peristome quite evenly rounded or with marked baso-palatal point (type intermediate). Alt. (of type) 7.56 mm., diam. 3.17 mm., alt. last whorl 4.14 mm., alt. apert. 2.49 mm., diam. apert. 2.03 mm., with $5\frac{3}{4}$ whorls remaining (+ about $6\frac{1}{2}$). Type locality (ANSP. 163726): MN2, in a sinkhole.

G. (Scalatella) striosa pumila new subspecies. Fig. 6.

Smaller, with relatively more widely spaced growth threads (14 on penult, 16 on last whorl); with about 30 wavy spiral ridgelets becoming more obscure towards base on last whorl; baso-palatal point weak and rounded. Alt. (of type) 6.04 mm., diam. 1.57 mm., alt. last whorl 2.23 mm., alt. apert. 1.22 mm., diam. apert. .88 mm., with almost 7 whorls remaining. Type locality (ANSP. 163727): EEJb.

Veronicella leptothali new species. Figs. 2 to 4.

Notum (in alcohol) ochre with indistinct gray dots except in mid-dorsal light stripe, and with darker spots arranged to form an irregular, wide-meshed network. Hyponotum lighter than notum but darker than sole, with fine darker dots usually becoming more evident towards posterior end. Anus evident. Notal length (of type) 40.5 mm., width 44 (17.7 mm.), sole width 15